UNITED STATES DEPARTMENT OF COMMERCE
U.S. Census Bureau
Washington, DC 20233-0001

September 27, 2021

MEMORANDUM FOR	Carolyn M. Pickering Survey Director, Survey of Income and Program Participation
From:	Anthony G. Tersine, Jr. *Anthony G. Tersine, Jr.* Chief, Demographic Statistical Methods Division
Subject:	Source and Accuracy Statement for The Survey of Income and Program Participation Calendar Year 2019 Data Collection Public Use Files (S&A-24)

This memorandum includes the Source and Accuracy Statement for the Survey of Income and Program Participation (SIPP) data collected during Calendar Year 2019.

The U.S. Census Bureau reviewed this data product for unauthorized disclosure of confidential information and approved the disclosure avoidance practices applied to this release. CBDRB-FY21-POP001-0233

If you have any questions about this document, please contact Tracy Mattingly at tracy.l.mattingly@census.gov or 301-763-6445, Mahdi Sundukchi at mahdi.s.sundukchi@census.gov or 301-763-4228, Faith Nwaoha-Brown at faith.n.nwaoha.brown@census.gov or 301-763-4696 or Jacob Eliason at jacob.z.eliason@census.gov or 301-763-3331 .

cc:

Elizabeth Sinclair	(ADDP)	Bethany DeSalvo	
Kevin Tolliver		Laryssa Mykyta	
David Waddington	(SEHSD)	Kurt Bauman	
Jason Fields		Shelley Irving	
Hyon Shin		Sharon Stern	
Adam Smith		Rachel Shattuck	
Trudi Renwick		James Farber	(DSMD)
Stephanie Galvin		Tracy Mattingly	
Alfred Gottschalck		Mahdi Sundukchi	
Rose Kreider		Ashley Westra	
Mark Klee		Faith Nwaoha-Brown	
Brian McKenzie		Julia Yang	
Liana Fox		Brice Gnahore	
Lindsay Monte		Jacob Eliason	
Jonathan Rothbaum			

[This page is intentionally left blank]

Demographic Statistical Methods Division
Sample Design and Estimation

Source and Accuracy Statement for Calendar Year 2019 Data Collection of the Survey of Income and Program Participation (SIPP)

Version 1.0
September 27, 2021

Faith Nwaoha-Brown
Jacob Eliason
Mahdi Sundukchi

James Farber, ADC
Tracy Mattingly, Lead Scientist

DRB Clearance Number – CBDRB-FY21-POP001-0233

Table of Contents

List of Tables

[This page is intentionally left blank]

1. Data Collection and Estimation

1.1 Source of Data

The data were collected in the 2018 and 2019 Panels of the Survey of Income and Program Participation (SIPP) [1]. The SIPP population universe is the civilian noninstitutionalized population living in the United States. The institutionalized population, which is composed primarily of the persons in correctional institutions and nursing homes (94 percent of the four million institutionalized people in the 2010 Census), is excluded from the SIPP universe.

Sample from each of the SIPP 2018 and SIPP 2019 Panels are located in 686 Primary Sampling Units (PSUs), each consisting of a county or a group of contiguous counties. Of these 686 PSUs, 252 are self-representing (SR) and 434 are non-self-representing (NSR). SR PSUs have a probability of selection of one and NSR PSUs have a probability of selection less than one. Within PSUs, Housing Units[2] (HUs) were systematically selected from the Master Address File (MAF), which is the U.S. Census Bureau's official inventory of known housing units. The MAF was created using the decennial censuses, as well as the U.S. Postal Service's Delivery Sequence File (DSF). The Census Bureau continues to update the MAF using the DSF and various automated, clerical, and field operations.

Housing Units were classified into two strata[3], such that one stratum had a higher concentration of low income households than the other. We oversampled the low income stratum by 29 percent to increase the accuracy of estimates for low income households and program participation. Analysts are strongly encouraged to use the SIPP weights when computing estimates since households are not selected with equal probability.

Households in each SIPP Panel sample were scheduled to be interviewed at yearly intervals over a period of roughly four years beginning in February 2018 for the SIPP 2018 Panel and March 2019 for the SIPP 2019 Panel. The reference period for the interview questions is the preceding twelve-month calendar year. The most recent month, December, is designated reference month 12 and the earliest month, January, is reference month one. One cycle of interviewing covering the entire sample of a SIPP panel, using the same questionnaire, is called a wave. Data for up to 12 reference months are available for respondents and specific months available depend on a person's sample entry and/or exit date. During interviewing, Field Representatives (FRs) identify a reference person who is usually the owner or renter of the residence. A household's reference person may change from wave to wave due to changes in the household composition over time.

---

[1] This source and accuracy statement can also be accessed through the U.S. Census Bureau website at *http://www.census.gov/programs-surveys/sipp/tech-documentation/source-accuracy-statements.html*

[2] The SIPP selects housing units which may or may not be occupied at the time of interview; occupied housing units are referred to as households.

[3] Household income used to determine the low income and non-low income strata was obtained from the most recent American Community Survey (ACS) data that was available when the SIPP 2018 Panel and SIPP 2019 Panel samples were selected in 2017 and 2018 respectively.

Following the first interview of the 2018 Panel, the SIPP adopted an overlapping panels design in which a new panel is fielded annually and overlaps with one or more ongoing previous panel(s). Figure 1 depicts the overlapping panels design for SIPP 2018 and subsequent panels. Beginning in 2019 with the SIPP 2018 and SIPP 2019 Panels, sampled households from multiple panels will be interviewed concurrently during each annual interview cycle and the combined data, covering the same reference period, will be referred to by the year of interview. The *SIPP Calendar Year 2019 data collection* – hereafter referred to as *CY19 data*[4] – consists of data from the SIPP 2018 Wave 2 and SIPP 2019 Wave 1 respondents who were interviewed 2019 and covers the reference period from January to December 2018.

The overlapping panel design was also implemented in early SIPP panels prior to the SIPP 1996 Panel. It allows analysts to combine data from multiple panels covering the same reference period for cross-sectional and longitudinal analyses, thus increasing the sample size, and decreasing standard errors SIPP key estimates (U.S. Census Bureau, 2020). Data Users should use data from all panels covering the same reference periods to compute SIPP key estimates in the overlapping panel design. Section 1.5 of the *2019 SIPP Users' Guide* further details the SIPP overlapping panel design, including comparisons to previous SIPP Panels.

Figure 1: Illustration of the Overlapping Panels Design for the SIPP 2018 and Subsequent Panels.

	Year of interview									
	2017	2018	2019	2020	2021	2022	2023	2024	2025	…
Panel			2018 Panel							
			2019	Panel[1]						
					2020 Panel					
						2021 Panel				
							2022 Panel			
								2023 Panel		
									2024 Panel	

[1] The SIPP 2019 Panel was terminated after Wave 1 due to low response rate.

The SIPP 2018 Panel began with a sample of about 53,500 HUs in Wave 1. About 8,800 of these HUs were found to be vacant, demolished, converted to nonresidential use, or otherwise ineligible for the survey. FRs were able to obtain interviews from about 26,000 of the eligible households. FRs were unable to interview approximately 18,500 eligible households in the panel because the occupants: (1) refused to be interviewed; (2) could not be found at home; (3) were temporarily absent; or (4) were otherwise unavailable. Thus, occupants of about 58 percent of all eligible households participated in the first interview of the 2018 Panel.

Approximately 24,500 of the 27,500 sampled SIPP 2019 Panel Wave 1 HUs were eligible for interview and 6,200 households were interviewed for a weighted response rate of 25.35

[4] CY19 data is referred to as the 2019 SIPP in the 2019 Users' Guide.

percent. The SIPP 2019 Panel was discontinued after the first wave due to low response. As a result, CY20 data will consist of SIPP 2018 Wave 3 and SIPP 2020 Wave 1 respondents.

Only original sample people (interviewed persons in Wave 1 sample households) and people living with them are eligible to be interviewed in subsequent waves. Original sample people who move from their Wave 1 address to a new address in later waves are still included in the SIPP sample. However, FRs attempt telephone interviews in lieu of in-person interviews if their new address is more than 100 miles from a SIPP sample area. Approximately 14,500 of the 24,000 SIPP 2018 Panel eligible HUs were interviewed in Wave 2. Therefore, CY19 data had a cross-sectional weighted response rate of 42.88 percent from respondents in 21,000 of the 49,000 HUs eligible for interview.

Since the SIPP follows all original sample members, those that form new households are also included in the SIPP sample. This expansion of original households can be estimated within the interviewed sample but is impossible to determine within the noninterviewed sample. Therefore, a growth factor based on the growth in the known sample is used to estimate the unknown expansion of the noninterviewed households. Growth factors account for the additional nonresponse stemming from the expansion of noninterviewed households and are calculated for Wave 2 and later waves. They provide a more accurate estimate of the weighted counts of noninterviewed households at each wave.

There are two categories of noninterviewed households: Type A and Type D. Type A noninterviewed households are eligible households where the interviewer obtains no interview. Type D noninterviewed households are previously interviewed households who moved to an unknown address or moved more than 100 miles from a SIPP interviewer and no telephone interview could be conducted. As a result, Type D noninterviews only occur from Wave 2 onwards. To calculate this loss of sample, or “sample loss,” we use Formula (1):

$$Sample\ Loss = \frac{(A_1 \times GF_c) + A_c + D_c}{I_c + (A_1 \times GF_c) + A_c + D_c} \tag{1}$$

where:

A_1 = weighted number of Type A noninterviewed households in Wave 1
A_c = weighted number of Type A noninterviewed households in the current wave
D_c = weighted number of Type D noninterviewed households in the current wave
I_c = weighted number of interviewed households in the current wave
GF_c = growth factor associated with the current wave.

Weighted sample loss for each wave of the SIPP 2018 and 2019 Panels calculated using equation (1) are tabulated in Table 1. The distribution of Type A nonrespondents by nonresponse reason is shown in Table 2.

Table 1. SIPP 2018 and SIPP 2019 Panels Household Counts, Sample Loss, and Weighted Response Rates

	Eligible Households[1]	Interviewed Households	Type A Households		Type D Households		Growth Factor	Cumulative Weighted Response Rates (percent)	Weighted Sample Loss (percent)
			Total	Weighted Rate (percent)	Total	Weighted Rate (percent)			
	SIPP 2018 Panel								
Wave 1	45,000	26,000	18,500	41.56	–	–	–	58.44	41.56
Wave 2	24,000	14,500	8,900	36.78	650	2.47	1.00	34.33	65.67
	SIPP 2019 Panel								
Wave 1	24,500	6,200	18,500	74.65	–	–	–	25.35	74.65

Source: U.S. Census Bureau, Survey of Income and Program Participation, Calendar Year 2018 and Calendar Year 2019.

[1] Interviewed and noninterviewed households may not sum up to eligible households due to rounding.

Table 2. SIPP 2018 and SIPP 2019 Panels Components of Type A Nonresponse by Wave

Panel	Wave	Language Problem	Unable to Locate	No One Home	Temporarily Absent	Household Refused	Other
SIPP 2018	**1**	1.46	0.21	13.29	2.24	76.14	6.65
	2	0.81	0.00	11.50	1.72	78.12	7.86
SIPP 2019	**1**	0.00	0.04	0.81	0.09	98.33	0.74

Source: U.S. Census Bureau, Survey of Income and Program Participation, Calendar Year 2018 and Calendar Year 2019

1.2 Weights Produced

The SIPP produces three weights for cross-sectional and longitudinal analyses: monthly weights (*WPFINWGT*), calendar year weights[5] (*WPFINWGT* when *MONTHCODE*=12), and longitudinal weights[6] (*FINYR<n>*, where *n* is the number of calendar years in the reference period covered by a longitudinal weight). Monthly and calendar year weights are cross-sectional weights because they are computed using data obtained from a single interview. Longitudinal weights, however, are computed by combining data from multiple interviews – i.e., two or more waves.

---

[5] Calendar year weights in the SIPP 2014 Panel Wave 1 through Wave 4 and CY18 source and accuracy documents were referred to as *CY<year>* where year was the calendar year reference period covered by the weights.

[6] Longitudinal weights were also referred to as Panel weights in the SIPP 1996 through SIPP 2014 Panels because the weights were computed from sample persons in a single panel. Longitudinal weights in the overlapping panels design however can include sample persons from more than one panel as depicted in Table 3 CY20 FINYR2 weights.

Monthly weights are used to calculate estimates for each of the 12 months within a calendar year. For each reference month, respondents who were in the SIPP survey universe and for whom data were obtained, receive positive monthly weights.

Calendar year weights cover the reference period from January to December of a specified calendar year and can be used to calculate estimates for any period within the year. Each CY*yy* data in the overlapping panels design covers the reference period from January to December 20*yy-1*, where 20*yy* is the year of interview and 20*yy-1* is the reference calendar year preceding the year of interview. Therefore, CY19 data calendar year weights can be used to compute monthly[7], quarterly, and annual estimates for any time between January and December 2018.

SIPP calendar year weights are based on the SIPP survey universe in December of a designated year. All interviewed persons in the SIPP survey universe who have positive December monthly weights are assigned calendar year weights equal to their monthly December weights. As a result, separate calendar year weight and replicate weight files are not produced for the CY19 data. Table 3 shows the reference period for calendar and longitudinal weights for the CY18 through CY21[8] data releases. The calendar year weights for years 2018, 2019, and 2020 incorporate data from the SIPP 2018 Panel through SIPP 2021 Panel in accordance with the overlapping panels design described in Section 1.1 and Figure 1.

Longitudinal weights cover reference periods of two or more calendar years and can be used to calculate estimates in this interval. The eligible sample cohort for longitudinal weights are persons who had positive calendar year weights in the first year of the longitudinal reference period. Eligible persons are classified as *interviewed for longitudinal weights* if they have positive calendar year weights in all subsequent years in the longitudinal reference period and receive positive longitudinal weights. Eligible persons who do not have calendar year weights in at least one year of the reference period are categorized as *noninterviewed for longitudinal weights* and are not assigned longitudinal weights.

Beginning with CY19 data, each data release under the overlapping panels design will include one, two, or three longitudinal weights – *FINYR2*, *FINYR3*, and *FINYR4* – covering a reference period of two, three and four earlier calendar years respectively. Each CY*yy FINYRn* longitudinal weight covers an *n*-year reference period ending in year 20*yy-1* with the last interview occurring in year 20*yy*. The number of longitudinal weights published with each CY*yy* data release depends on the length of each ongoing panel whose sampled households were interviewed in 20*yy*. Table 3 lists the longitudinal weights published with CY18 through CY21 data files.

---

[7] We recommend analysts use monthly weights instead of calendar year weights to compute monthly estimates as using calendar year weights may result in fewer sample persons.

[8] Table 3 shows calendar year weights and longitudinal weights from CY18 through CY21 data releases because the first SIPP Panel in the overlapping panels design (SIPP 2018 Panel) ends in CY21 data release.

CY19 *FINYR2* weights cover the two-year reference period from January 2017 to December 2018. The eligible sample cohort for CY19 *FINYR2* weights are persons who had positive calendar year weights in the first year of the reference period, i.e., persons with positive December 2017 weights. About 64,000 persons were eligible for CY19 FINYR2 weights and 33,000 of them were classified as interviewed and received positive longitudinal weights for a weighted response rate of 51.34 percent. Longitudinal response rate is computed at the person level as household compositions may change over the longitudinal reference period.

Unlike the SIPP 2014 and earlier SIPP Panels, longitudinal weights in the overlapping panel design may include persons from multiple panels. The eligible sample cohort for CY21 *FINYR2* weights is highlighted in Table 3 and consists of SIPP 2018 Panel Wave 3 and SIPP 2020 Panel Wave 1 sample persons who had positive calendar year weights in 2019.

Table 3. Calendar Year Weights and Longitudinal Weights for CY19 through CY21 data in the Overlapping Panels Design.

SIPP Panel	**CY*yy* data, where 20*yy* is the year of interview**			
	CY18	**CY19**	**CY20**	**CY21**
2018	Wave 1	Wave 2	Wave 3	Wave 4
2019		Wave 1	**SIPP 2019 Panel Terminated**	
2020			Wave 1	Wave 2
2021				Wave 1
Cross-Sectional Reference Calendar Years Covered by CY*yy* File				
	2017	2018	2019	2020
Calendar Year Weights Produced for CY*yy* File[1]				
	WPFINWGT for MONTHCODE=12	WPFINWGT for MONTHCODE=12[1]	WPFINWGT for MONTHCODE=12[2]	WPFINWGT for MONTHCODE=12[3]
Longitudinal Weights Produced for CY*yy* File				
FINYR2	–	✓	✓	✓
FINYR3	–	–	✓	✓
FINYR4	–	–	–	✓

[1] 2018 calendar year weights incorporate data from SIPP 2018 Panel Wave 2 and SIPP 2019 Panel Wave 1 sample.
[2] 2019 calendar year weights incorporate data from SIPP 2018 Panel Wave 3 and SIPP 2020 Panel Wave 1 sample.
[3] 2020 calendar year weights incorporate data from SIPP 2018 Panel Wave 4, SIPP 2020 Panel Wave 2, and SIPP 2021 Panel Wave 1 sample.

1.3 Estimation

The SIPP estimation procedure involves several stages of weight adjustments to derive the final person level weights. The cross-sectional weighting procedure for overlapping panels data – pooled data from two or more panels whose sample persons were interviewed in the same year and hence have the same reference period as shown in Figure 1 and Table 3 – is divided into two steps: (1) Noninterview adjustment and (2) second stage adjustment.

Household noninterview adjustment is conducted separately for each panel due to the different selection probabilities and response rates across panels. The nonresponse adjustment procedure depends on the specific waves in each panel. CY19 household noninterview adjustments adjusts for nonresponse among SIPP 2018 Panel Wave 2 and SIPP 2019 Panel Wave 1 sample households. For Wave 1 households, each eligible household is first given a base weight (BW) equal to the inverse of its probability of selection. Base weights are multiplied by a weighting control factor (WCF) to adjust for subsampling done in the field when the number of sampled units is much larger than expected. A noninterview adjustment factor (F_{N1}) is then applied to account for eligible households that FRs could not interview to create the Wave 1 noninterview adjusted weights and assigned to all household members.

For Wave 2 households, each eligible household in is assigned an initial weight equal to its Wave 1 household noninterview adjusted weight $(INITwgt_{W1})$. Initial weights are multiplied by movers' adjustment factors (MF) to account for multiple chances of selection of movers[9]. The resulting movers' weights are multiplied by the noninterview adjustment factor (F_{N2}) to adjust for household nonresponse in the Wave 2 and create household noninterview adjusted weights, which are assigned to all household members.

Next, the second stage adjustment is implemented on the pooled sample from all contributing panels. Noninterview adjusted weights are multiplied by an *overlapping panel factor* (OPF_{panel}) to adjust for combining sample households from multiple panels and a second stage adjustment factor (F_{2S}) to create final person weights. The second stage adjustment equalizes married spouses' weights and rakes the sum of person weights to independent population controls (benchmark population estimates) by age, race, sex, Hispanic origin, and state of residence. Additional details of the weighting process are in Tersine (2020a) and Tersine (2021).

In summary, the final cross-sectional weight (FW_c) for each month c, in CY19 data is

$$\begin{aligned} &BW * WCF * F_{N1} * OPF_{s19} * F_{2S} && \text{for SIPP 2019 Panel sample persons} \\ &INITwgt_{W1} * MF * F_{N2} * OPF_{s18} * F_{2S} && \text{for SIPP 2018 Panel sample persons} \end{aligned}$$

[9] Movers – persons who move into SIPP sample households after Wave 1 interviews – have two chances to become SIPP sample persons: (a) selection into original SIPP sample households in Wave 1 or (b) selection by moving into a sample household after Wave 1.

For longitudinal weights, eligible persons are given an initial weight (IW) equal to their cross-sectional household noninterview adjusted weight for the first year of the reference period. A noninterview adjustment factor (FP_{ni}) is then applied to account for person level nonresponse. A Longitudinal Overlapping Panel Factor $(LOPF_{panel})$ is applied to the noninterview adjusted weights if the longitudinal cohort consists of persons from more than one panel. Finally, a second stage adjustment (FP_{2S}) is applied to adjust the noninterview weights to independent population controls for December *20yy-1*, the last month of the longitudinal reference period. Spouse weights are not equalized in the longitudinal weighting procedure.

The final longitudinal weight is $CY19\ FINYR2 = IW * FP_{ni} * LOPF_{2018} * FP_{2S}$ with $LOPF_{2018} = 1$ since only SIPP 2018 Panel sample persons are eligible for CY19 FINYR2 weight. Additional details of the weighting process are in *Survey of Income and Program Participation Longitudinal Weighting Specifications for Calendar Year 2019 and Subsequent Years (WGT-35)*.

1.4 Population Controls

The SIPP estimation procedure adjusts weighted sample estimates to agree with independently derived population estimates of the civilian noninstitutionalized population. This attempts to correct for undercoverage and thereby reduces the mean square error of the estimate. The national and state level population controls are obtained directly from the Population Division and are prepared each month to agree with the most current set of population estimates released by the Census Bureau's population estimates and projections program.

Longitudinal weights in the overlapping panels design use the population controls for the last month of the reference period. As a result, all longitudinal weights and calendar year weights released with each CY*yy* data sum up to the population controls for December 20*yy*-1.

The national level controls are distributed by demographic characteristics as follows:
- Age, Sex, and Race (White alone, Black alone, and all other groups combined)
- Age, Sex, and Hispanic Origin

The state level controls are distributed by demographic characteristics as follows:
- State, Age, and Sex
- State, Hispanic origin
- State, Race (Black alone, all other groups combined)

The estimates begin with the latest decennial census as the base and incorporate the latest available information on births and deaths along with the latest estimates of net international migration. The net international migration component in the population estimates includes a combination of:
- Legal migration to the U.S.,
- Emigration of foreign born and native people from the U.S.,

- Net movement between the U.S. and Puerto Rico,
- Estimates of temporary migration, and
- Estimates of net residual foreign-born population, which include unauthorized migration.

Because the latest available information on these components lags the survey date, it is necessary to make short-term projections of these components to develop the estimates for the survey date.

1.5 Use of Weights

The SIPP monthly, calendar year, and longitudinal weights are produced at the person level and are intended for analyzing data at the person level. Every interviewed person in the SIPP universe for a given reference month – and for whom data were obtained – has a person month weight for that reference month. Likewise, persons who had data for the month of December have calendar year weights, and persons categorized as *interviewed for a longitudinal weight* are assigned corresponding longitudinal weights. Chapter 7 of the 2019 *SIPP Users' Guide* provides additional information on how to use the survey weights.

The SIPP 2008 and earlier SIPP Panels' public use files also contained household, family, and related subfamily monthly weights for analyzing the data at the appropriate household and family levels. These weights were set to be the person month weight of the household, family, or subfamily reference person for that reference month[10]. For the SIPP 2014 Panel and subsequent panels, the household structure of an interviewed unit is only set for the interview month. Up to five addresses are recorded for each person for the reference period, so interviewed persons can live in different households depending on the reference month. Therefore, for each reference month it is possible to tell which interviewed persons lived together and their relationships to each other, but the files do not specify a household ID or reference person for each of the reference months. The same is true for families. If a data user would like to conduct analysis at the household or family level, person weights can be used to specify a single household or family weight. One option is to use the average of the person month weights for all persons in the household or family. Another option is to specify a household or family reference person and use his or her person month weight as the household or family weight.

All estimates may be divided into two broad categories: longitudinal and cross-sectional. Longitudinal estimates require that data records for each person be linked across interviews, whereas cross-sectional estimates do not. For example, estimating the average duration of unemployment from October 2017 to September 2018 requires linking records from CY18 data (SIPP 2018 Wave 1) and CY19 data (SIPP 2018 Wave 2 and SIPP 2019 Wave 1, restricted to Wave 1 SIPP 2018 sample persons) and would be a longitudinal estimate. Cross-sectional estimates can combine data from different interviews only at the aggregate level because there

[10] Only person-level calendar year and longitudinal weights were available in previous SIPP panels.

is no linkage between interviews; for example, comparing the national unemployment rate in September 2017 to that September 2018.

Data users are strongly encouraged to use the weights provided as instructed. Weights can vary due to the sample design, the level of nonresponse, and the time period of the estimate. Calculating estimates without using the weights as instructed will produce erroneous results.

Some basic types of estimates that can be constructed using monthly, calendar year, and longitudinal weights are described below in terms of estimated numbers. More complex estimates, such as percentages, averages, ratios, etc., can be constructed from the estimated numbers.

1. The number of people who have ever experienced a characteristic during a given time period.

   To construct such an estimate, use the person weight for the shortest time period which covers the entire time period of interest. Then sum the weights over all people who possessed the characteristic of interest at some point during the time period of interest. For example, to estimate the number of people who received Supplemental Nutrition Assistance Program (SNAP) benefits in January 2018, sum the monthly weights (*WPFINWGT*, with *MONTHCODE*=1) of all persons who received SNAP benefits in January 2018.

   To estimate the number of persons who experienced poverty at any point between January 2017 and December 2018, sum the two-year longitudinal weights (*FINYR2*) of all persons who were in poverty during this time frame.

2. The amount of a characteristic accumulated by people during a given time period.

   To construct such an estimate, use the person weight for the shortest time period which covers the entire time period of interest. Compute the product of the weight and the amount of the characteristic and sum this product over all appropriate people. For example, to estimate the aggregate 2018 annual income of people who were employed during all 12 months of the year, multiply the CY19 calendar year weights (*WPFINWGT*, with *MONTHCODE*=12) of all persons who were employed in all months of 2018 by their annual income and sum the resulting products.

3. The average number of consecutive months of possession of a characteristic (i.e., the average spell length for a characteristic) during a given time period.

   For example, one could estimate the average length of each spell of Supplemental Security Income (SSI) receipt during 2018. One could also estimate the average spell of unemployment that elapsed before a person found a new job. To construct such an estimate, first identify the people who possessed the characteristic at some point during the period of interest. Then create two sums of these persons' appropriate weights: (1) sum the product of the weight times the number of months the spell lasted and (2) sum the weights only. The estimated average spell length in months is computed as (1) divided by (2). A person who experienced two spells during the time period of interest would be treated as two people and appears twice in sums (1) and (2). An alternate method of calculating the average can be found in the Section 3.6

4. The number of month-to-month changes in the status of a characteristic (i.e., number of transitions) summed over every set of two consecutive months during the time period of interest.

   To construct such an estimate, sum the appropriate person weights each time a change is reported between two consecutive months during the period of interest. For example, to estimate the number of people who were in poverty in July 2018 and transitioned out of poverty in August 2018, add the CY19 calendar year weights of each person who had such a change.

   To estimate the number of changes in monthly earned income during the 2018 fiscal year (September 2017 to September 2018) use CY19 FINYR2 weights. Sum the weighted number of people who had a change between September and October, between October and November, between November and December, …, and between August and September.

   Spell and transition estimates should be used with caution because of the biases that are associated with them. Sample people tend to report the same status of a characteristic for all months of a reference period. This tendency also affects transition estimates in that, for many characteristics, the number of characteristics, the number of month-to-month transitions reported between the last month of one reference period and the first month of the next reference period are much greater than the number of reported transitions between any two months within a reference period. Additionally, spells extending before or after the time period of interest are cut off (censored) at the boundaries of the time period. If they are used in estimating average spell length, a downward bias will result.

5. Monthly estimates of a characteristic averaged over consecutive months.

   For example, one could estimate the monthly average number of Temporary Assistance for Needy Families (TANF) recipients from July 2018 through December 2018. To construct such an estimate, first form an estimate for each month in the time period of interest. Sum the CY19 calendar year weight (i.e., *WPFINWGT,* with *MONTHCODE*=12), of all persons who possessed the characteristic of interest during each of the six months of interest. Then sum the monthly estimates and divide by six, the number of months.

2. Accuracy of Estimates

SIPP estimates are based on a sample; they may differ somewhat from the figures that would have been obtained from a complete census using the same questionnaire, instructions, and enumerators. There are two types of errors possible in an estimate based on a sample survey: sampling and nonsampling errors. For a given estimator, the difference between an estimate based on a sample and the estimate that would result if the sample were to include the entire population is known as sampling error. For a given estimator, the difference between the estimate that would result if the sample were to include the entire population and the true population value being estimated is known as nonsampling error. We can provide estimates of the magnitude of SIPP sampling error, but this is not true of nonsampling error.

2.1 Nonsampling Error

Nonsampling errors can be attributed to many sources:

- inability to obtain information about all cases in the sample
- definitional difficulties
- differences in the interpretation of questions
- inability or unwillingness on the part of the respondents to provide correct information
- errors made in the following: collection such as in recording or coding the data, processing the data, estimating values for missing data
- biases resulting from the differing recall periods caused by the interviewing pattern used and undercoverage.

Quality control and edit procedures were used to reduce errors made by respondents, coders, and interviewers. More detailed discussions of the existence and control of nonsampling errors in the SIPP can be found in the *SIPP Quality Profile, 1998 SIPP Working Paper Number 230*, issued June 1998 (Kalton, 1998), the *SIPP 2018 Users' Guide* (U.S. Census Bureau, 2020) and the *SIPP 2019 Users' Guide* (U.S. Census Bureau, 2021).

Undercoverage in SIPP results from missed HUs and missed persons within sample HUs. It is known that undercoverage varies with age, race, and sex. Generally, undercoverage is larger for males than for females and larger for Blacks than for non-Blacks. Ratio estimation to independent age-race-sex-Hispanic origin population controls during the second stage adjustment step of the SIPP weighting procedure partially corrects for the bias due to survey undercoverage. However, biases exist in the estimates to the extent that persons in missed households or missed persons in interviewed households have characteristics different from those of interviewed persons in the same age-race-sex-Hispanic origin group.

A common measure of survey coverage is the coverage ratio, the estimated population before second stage adjustment divided by the independent population control. Tables 4 and 5 show coverage ratios for age-sex-race-Hispanic origin groups in December 2018 using calendar year weights and longitudinal weights respectively prior to post stratification ratio adjustments. The

SIPP coverage ratios exhibit some variability from month to month. Other Census Bureau household surveys (e.g. the Current Population Survey) experience similar coverage.

Caution should be exercised when comparing the SIPP CY19 data with data from other SIPP products[11] or with data from other surveys. The comparability problems are caused by sources such as the seasonal patterns for many characteristics, different nonsampling errors, and different concepts and procedures. Refer to the *SIPP Quality Profile* (Kalton, 1998) for known differences with data from other sources and further discussions.

[11] Analysts should be cautious when comparing estimates from the Re-engineered SIPP Panels (i.e., The SIPP 2014 and subsequent SIPP panels) to previous panels as the SIPP was redesigned following the SIPP 2008 Panel. The questionnaire, interview frequency, collection format, and sample size of the SIPP 2014 and later panels differ from those of previous SIPP panels. Detailed information on the reengineered SIPP are provided in the 2014 SIPP Users' Guide and the 2018 SIPP Users' Guide.

Table 4. Coverage Ratios for December 2018 for Calendar Year Weights by Age, Race, Sex, and Hispanic Origin

Age	All Persons		White non-Hispanic		Black non-Hispanic		Other non-Hispanic		Hispanic (of any race)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
<15	0.73	0.72	0.77	0.75	0.70	0.68	0.72	0.77	0.67	0.64
15	0.74	0.75	0.78	0.76	0.80	0.76	0.67	0.71	0.67	0.72
16-17	0.71	0.71	0.72	0.74	0.78	0.73	0.69	0.70	0.65	0.65
18-19	0.73	0.71	0.76	0.74	0.72	0.71	0.66	0.70	0.68	0.66
20-21	0.69	0.68	0.72	0.70	0.62	0.61	0.74	0.71	0.64	0.65
22-24	0.68	0.62	0.71	0.63	0.62	0.61	0.67	0.68	0.64	0.58
25-29	0.65	0.66	0.71	0.67	0.53	0.65	0.72	0.68	0.53	0.63
30-34	0.69	0.68	0.78	0.72	0.47	0.54	0.68	0.66	0.60	0.67
35-39	0.70	0.73	0.76	0.76	0.55	0.65	0.68	0.75	0.62	0.70
40-44	0.72	0.72	0.78	0.73	0.66	0.76	0.71	0.74	0.61	0.67
45-49	0.74	0.78	0.76	0.81	0.73	0.71	0.82	0.82	0.61	0.72
50-54	0.77	0.84	0.79	0.87	0.78	0.78	0.86	0.89	0.66	0.78
55-59	0.88	0.93	0.89	0.95	0.95	1.00	0.91	0.82	0.75	0.86
60-61	1.00	0.97	1.03	0.99	1.01	0.95	0.87	0.87	0.84	0.89
62-64	0.98	1.02	1.02	1.05	0.95	1.01	0.89	0.86	0.80	0.93
65-69	1.12	1.09	1.15	1.11	1.09	1.14	1.06	1.05	0.93	0.93
70-74	1.12	1.18	1.16	1.21	1.07	1.20	1.07	1.08	0.91	1.00
75-79	1.25	1.16	1.31	1.20	1.12	1.04	1.06	1.03	0.99	1.01
80-84	1.23	1.16	1.27	1.19	1.13	1.17	1.05	1.02	0.99	0.97
85+	1.23	1.08	1.27	1.08	1.01	1.18	1.05	1.08	1.00	0.96

Source: U.S. Census Bureau, Survey of Income and Program Participation, Calendar Year 2019.

Table 5. Coverage Ratios for December 2018 for Longitudinal Weights (*CY19 FINYR2*) Weights by Age, Race, Sex, and Hispanic Origin

Age	All Persons		White non-Hispanic		Black non-Hispanic		Other non-Hispanic		Hispanic (of any race)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
<15	0.77	0.75	0.83	0.77	0.58	0.64	0.81	0.84	0.74	0.73
15	0.79	0.91	0.86	0.96	0.86	0.88	0.73	0.81	0.68	0.86
16-17	0.77	0.81	0.80	0.85	0.83	0.84	0.74	0.77	0.68	0.72
18-19	0.81	0.85	0.86	0.89	0.75	0.90	0.76	0.75	0.75	0.80
20-21	0.69	0.67	0.71	0.69	0.66	0.61	0.75	0.76	0.64	0.59
22-24	0.73	0.59	0.76	0.58	0.67	0.60	0.75	0.71	0.67	0.53
25-29	0.65	0.65	0.69	0.63	0.52	0.63	0.83	0.73	0.57	0.70
30-34	0.74	0.70	0.81	0.74	0.48	0.44	0.83	0.69	0.68	0.80
35-39	0.77	0.83	0.82	0.83	0.60	0.72	0.80	0.82	0.71	0.87
40-44	0.81	0.81	0.85	0.78	0.74	0.89	0.82	0.84	0.74	0.86
45-49	0.85	0.86	0.87	0.84	0.82	0.81	0.94	1.11	0.74	0.84
50-54	0.89	0.95	0.91	0.94	0.81	0.87	0.95	1.18	0.83	0.92
55-59	0.98	1.03	0.97	1.00	1.14	1.20	1.13	1.07	0.85	1.03
60-61	1.13	1.09	1.15	1.07	1.07	1.18	1.16	1.05	1.04	1.16
62-64	1.07	1.12	1.09	1.11	1.07	1.20	1.13	1.02	0.92	1.18
65-69	1.23	1.22	1.25	1.21	1.21	1.30	1.38	1.28	1.03	1.19
70-74	1.23	1.31	1.25	1.30	1.13	1.41	1.38	1.35	1.05	1.25
75-79	1.38	1.29	1.43	1.30	1.16	1.24	1.40	1.20	1.11	1.27
80-84	1.42	1.25	1.46	1.25	1.20	1.29	1.43	1.32	1.19	1.16
85+	1.29	1.21	1.31	1.20	1.18	1.34	1.34	1.30	1.07	1.20

Source: U.S. Census Bureau, Survey of Income and Program Participation, Calendar Year 2018 and Calendar Year 2019

3. Sampling Variability and Computation of Standard Errors

Standard errors indicate the magnitude of the sampling error. They also partially measure the effect of some nonsampling errors in response and enumeration, but do not measure any systematic biases in the data. The standard errors for the most part measure the variations that occurred by chance because a sample rather than the entire population was surveyed.

3.1 Confidence Intervals

The sample estimate and its standard error enable one to construct a confidence interval. A confidence interval is a range about a given estimate that has a known probability of including the result of a complete enumeration. For example, if all possible samples were selected, each of these being surveyed under essentially the same conditions and using the same sample design, and if an estimate and its standard error were calculated from each sample, then:

1. Approximately 68 percent of the intervals from one standard error below the estimate to one standard error above the estimate of all possible samples would include the actual value of the population parameter.

2. Approximately 90 percent of the intervals from 1.645 standard errors below the estimate to 1.645 standard errors above the estimate of all possible samples would include the actual value of the population parameter.

3. Approximately 95 percent of the intervals from two standard errors below the estimate to two standard errors above the estimate of all possible samples would include the actual value of the population parameter.

The estimate derived from all possible samples may or may not be contained in any computed interval. However, for a particular sample, one can say with a specified confidence that the estimate derived from all possible samples is included in the confidence interval.

3.2 Hypothesis Testing

Standard errors may also be used for hypothesis testing, a procedure for distinguishing between population characteristics using sample estimates. The most common types of hypotheses tested are 1) the population characteristics are identical versus 2) they are different. Tests may be performed at various levels of significance, where a level of significance is the probability of concluding that the characteristics are different when, in fact, they are identical. The Census Bureau uses 90 percent confidence level for hypothesis testing but stricter confidence levels – for example 95 percent or higher – may also be used.

To perform the most common test, compute the difference $X_A - X_B$, where X_A and X_B are sample estimates of the characteristics of interest. A later section explains how to derive an estimate of the standard error of the difference $X_A - X_B$. Let that standard error be S_{DIFF}. Calculate a test statistic $|z|$, as $|z| = |X_A - X_B|/S_{DIFF}$. For large sample sizes, one can conclude the difference is significant at the 90 percent confidence level if $|z|$ is larger than the critical value of 1.645.

Confidence intervals can also be used to test for significant difference between two sample estimates. If $X_A - X_B$ is between $(-1.645 \times S_{DIFF})$ and $(+1.645 \times S_{DIFF})$, no conclusion about the characteristics is justified at the 10 percent significance level. If, on the other hand $X_A - X_B$, is smaller than $(-1.645 \times S_{DIFF})$ or larger than $(+1.645 \times S_{DIFF})$, the observed difference is significant at the 10 percent significance level. In this event, it is commonly accepted practice to say that the characteristics are significantly different. In accordance with the Census Bureau's Statistical Quality Standards, we recommend that users report only those differences that are significant at the 10 percent significance level or better. Of course, sometimes this conclusion will be wrong. When the characteristics are the same, there is a 10 percent chance of concluding that they are different.

Note that as more tests are performed, more erroneous significant differences will occur. For example, at the 10 percent significance level, if 100 independent hypothesis tests are performed in which there are no real differences, it is likely that about 10 erroneous differences will occur. Therefore, the significance of any single test should be interpreted cautiously. A Bonferroni correction can be used to account for this potential problem. The Bonferroni method involves dividing your stated level of significance by the number of tests you are performing (Sedgwick, 2014; Stoline, 1981). This correction results in a conservative test of significance.

Because of the large standard errors involved, there is little chance that estimates will reveal useful information when computed on a small number of sample cases. We recommend a minimum weighted estimate – i.e., the weighted totals of the sample cases included in the analysis – of 200,000 for computing cross-sectional estimates and 300,000 for computing longitudinal estimates. Nonsampling error in one or more of the small number of cases providing the estimation can also cause large relative error in that particular estimate. Care must be taken in the interpretation of small differences since even a small amount of nonsampling error can cause a borderline difference to appear significant or not, thus distorting a seemingly valid hypothesis test.

3.3 Calculating Standard Errors for SIPP Estimates

There are two main ways we calculate the Standard Errors (SEs) for SIPP Estimates. They are as follows:

- Direct estimates using replicate weight methods (highly recommended); and
- Generalized variance function parameters (denoted as a and b).

Replicate weight methods provide the most accurate variance estimates but may require more computing resources and expertise on the part of the user. The Generalized Variance Function (GVF) parameters provide a method of balancing accuracy with resource usage as well as having a smoothing effect on SE estimates across time. SIPP uses the Replicate Weighting Method to produce GVF parameters (see Chapter 7 of K. Wolter, *Introduction to Variance Estimation,* for more information). Table 6 shows calendar year 2018 SIPP key estimates their standard errors, coefficient of variation and item response rates computed from CY19 data. Standard errors for the key estimates were computed using replicate weights and Fay's BRR method.

Table 6: Calendar year 2018 SIPP key estimates computed from CY19 data.

Key Estimate	Estimate	Standard Error	Coefficient of Variation	Item Response Rate
Median annual household earnings	41,500	411	0.99	66.01
Median annual household income	61,710	530	0.86	48.99
Median household net worth	97,950	2,182	2.23	38.31
Poverty rate	12.40	0.33	2.62	57.07
Percent of households receiving means-tested benefits[1]	21.32	0.53	2.48	80.11
Percent receiving means-tested transfer income[2]	14.44	0.30	2.08	85.76
Percent receiving Supplemental Nutrition Assistance Program (SNAP) benefits	11.45	0.29	2.54	93.46
Percent receiving Supplemental Security Income (SSI)	3.07	0.10	3.37	87.72
Percent receiving income from social insurance programs[3]	25.01	0.18	0.70	86.91
Percent receiving Old Age, Survivors and Disability Insurance (OASDI) income	22.44	0.15	0.66	88.19
Percent covered by public health insurance	38.29	0.34	0.88	88.40
Percent covered by Medicaid	22.04	0.33	1.49	89.86
Percent covered by Medicare	18.87	0.12	0.63	89.62
Percent covered by private health insurance	66.44	0.38	0.57	92.36
Percent covered by employer-sponsored health insurance	55.31	0.38	0.68	87.18
Percent uninsured	8.09	0.19	2.34	88.41
Percent with a retirement plan or account	42.03	0.28	0.66	87.29
Percent of workers working two or more jobs	17.67	0.31	1.75	89.96
Percent of workers who are self-employed	13.59	0.27	1.99	93.55
Percent of workers who worked full-time, year-round	61.80	0.35	0.56	82.21
Percent of workers who work from home at least one day per week	15.53	0.30	1.94	99.97
Children ever born per 1,000 women age 15 to 50	1226	14.29	1.17	51.45
Children ever born per 1,000 men age 15 to 50	945	12.86	1.36	40.53
Percent of mothers with multi-partner fertility	18.93	0.36	1.90	70.51

Key Estimate	Estimate	Standard Error	Coefficient of Variation	Item Response Rate
Percent of fathers with multi-partner fertility	15.89	0.36	2.25	66.02
Percent with a disability (age 1+)	20.16	0.22	1.09	88.85
Percent of households who experienced a change in composition	14.92	0.34	2.29	100.00

Source: U.S. Census Bureau, Survey of Income and Program Participation, Calendar Year 2019.
[1] Means-tested benefits include Medicaid, Supplemental Nutrition Assistance Program (SNAP), Supplemental Security Income (SSI), General Assistance (GA), Temporary Assistance for Needy Families (TANF), or special Supplemental Nutrition Program for Women Infants and Children (WIC).
[2] Means-tested transfer income include SNAP, SSI, TANF, WIC, and GA.
[3] Social insurance programs include Old Age, Survivors and Disability Insurance (OASDI), Veteran Affairs (VA) benefits, Workers Compensation (WC), and Unemployment Compensation (UC).

3.4 Standard Error Parameters and Tables and Their Use

Most SIPP estimates have greater standard errors than those obtained through a simple random sample because of SIPP's two-stage clustered sample design. To derive standard errors that would be applicable to a wide variety of estimates and could be prepared at a moderate cost, a few approximations were required.

Estimates with similar standard error behavior were grouped together and two parameters (denoted as a and b) were developed to approximate the standard error behavior of each group of estimates. Because the actual standard error behavior was not identical for all estimates within a group, the standard errors computed from these parameters provide an indication of the order of magnitude of the standard error for any specific estimate. These a and b parameters vary by characteristic and by demographic subgroup to which the estimate applies. Table 7 and 8 provide $a$and b parameters for the core domains to be used for the CY19 cross-sectional (monthly and calendar year) and longitudinal estimates.

The creation of appropriate a and b parameters for the types of estimates previously given in Section 1.5 are described below.

1. The number of people who have ever experienced a characteristic during a given time period.

   The appropriate a and b parameters are obtained directly from Table 7 or 8. The choice of parameter depends on the weights used, the characteristic of interest, and the demographic subgroup of interest.

2. Amount of a characteristic accumulated by people during a given time period. The appropriate a and b parameters are also taken directly from Table 7 or 8.

3. The average number of consecutive months of possession of a characteristic per spell (i.e., the average spell length for a characteristic) during a given time period.

   Start with the appropriate base a and b parameters from Table 7 or 8. The parameters are then inflated by an additional factor, g, to account for people who experience multiple spells during the time period of interest. This factor is computed by:

$$g = \frac{\sum_{i=1}^{n} m_i^2}{\sum_{i=1}^{n} m_i} \tag{2}$$

   where there are *n* people with at least one spell and m_i is the number of spells experienced by person i during the time period of interest.

4. The number of month-to-month changes in the status of a characteristic (i.e., number of transitions) summed over every set of two consecutive months during the time period of interest.

   Obtain a set of adjusted a and b parameters exactly as just described in 3, then multiply these parameters by an additional factor. Use 1.0 if the time period of interest is two months and 2.0 for a longer time period. (The factor of 2.0 is based on the conservative assumption that each spell produces two transitions within the time period of interest.)

5. Monthly estimates of a characteristic averaged over a number of consecutive months.

   Appropriate base a and b parameters are taken from Table 7 or 8.

3.5 Standard Errors of Estimated Numbers

The approximate standard error, s_x, of an estimated number of persons, households, families, unrelated individuals and so forth, can be obtained using Formula (3). Note that this method should be applied to dollar values

$$s_x = \sqrt{ax^2 + bx} \tag{3}$$

Here x is the size of the estimate and a and b are the appropriate parameters from Tables 7 or 8 associated with the characteristic being estimated and the appropriate reference period.

Illustration 1.
Suppose SIPP estimates based on CY19 data show that there were 5,330,000 females aged 25 to 44 with a monthly earned income greater than $6,000 in September 2018. The appropriate parameters and factor from Table 7 are:

$$a = -0.00006093 \quad b = 8{,}267$$

Using Formula (3), the approximate standard error is:

$$s_x = \sqrt{(-0.00006093 \times 5{,}330{,}000^2) + (8{,}267 \times 5{,}330{,}000)} = 205{,}748\ females.$$

The approximate 90 percent confidence interval as shown by the data is from 4,991,545 to 5,66,8,455 females ($i.e., 5{,}330{,}000 \pm 1.645 \times 205{,}748$). Therefore, 90 percent of confidence intervals from all possible samples will contain the actual number of females aged 25 to 44 with a monthly earned income greater than $6,000 in September 2018 in the population.

3.6 Standard Error of a Mean

A mean is defined here to be the average quantity of some item (other than persons, families, or households) per person, family or household. For example, it could be the average monthly household income for a specified demographic. The standard error of a mean can be approximated by Formula (4) below. Because of the approximations used in developing Formula (4), an estimate of the standard error of the mean obtained from this formula will generally underestimate the true standard error. The formula used to estimate the standard error of a mean $\bar{x}$ is:

$$s_{\bar{x}} = \sqrt{\left(\frac{b}{y}\right) s^2}, \tag{4}$$

where y is the size of the base, s^2 is the estimated population variance of the item and b is the parameter associated with the particular type of item.

The population variance s^2 may be estimated by one of two methods. In both methods, we assume x_i is the value of the item for i^{th} unit. (A unit may be person, family, or household). To use the first method, the range of values for the item is divided into c intervals. The lower and upper boundaries of interval j are Z_{j-1} and Z_j, respectively. Each unit, x_i, is placed into one of c intervals such that $Z_{j-1} < x_i \leq Z_j$. The estimated population mean, $\bar{x}$, and variance, s^2, are given by the formulas:

$$\bar{x} = \sum_{j=1}^{c} p_j m_j \tag{5a}$$

$$s^2 = \sum_{j=1}^{c} p_j m_j^2 - \bar{x}^2 \tag{5b}$$

where $m_j = (Z_{j-1} + Z_j)/2$, and p_j is the estimated proportion of units in the interval j. The most representative value of the item in the interval j is assumed to be m_j. If the interval c is open-ended, or no upper interval boundary exists, then an approximate value for m_c is

$$m_c = \frac{3}{2} Z_{c-1}.$$

In the second method, the estimated population mean, $\bar{x}$, and variance, s^2 are given by:

$$\bar{x} = \frac{\sum_{i=1}^{n} w_i x_i}{\sum_{i=1}^{n} w_i} \tag{6a}$$

$$s^2 = \frac{\sum_{i=1}^{n} w_i x_i^2}{\sum_{i=1}^{n} w_i} - \bar{x}^2 \tag{6b}$$

where there are n units with the item of interest and w_i is the final weight for i^{th} unit. (Note that $\sum w_i = y.$)

Illustration 2.

Method 1

Suppose that based on CY19 data, the distribution of annual income for persons aged 25 to 34 who were employed for all 12 months of 2018 is given in Table A.

Table A. Hypothetical Distribution of Annual Cash Income among People 25 to 34 Years Old (Not Actual Data, Only Use for Calculation Illustrations)

Interval of Annual Cash Income	**Number of People in Each Interval (in thousands)**	**Cumulative Number of People with at Least as Much as Lower Bound of Each Interval (in thousands)**	**Percent of People with at Least as Much as Lower Bound of Each Interval**
under \$5,000	370	23,527	100
\$5,000 to \$7,500	302	23,158	98.4
\$7,500 to \$9,999	447	22,856	97.1
\$10,000 to \$12,499	685	22,409	95.2

Interval of Annual Cash Income	Number of People in Each Interval (in thousands)	Cumulative Number of People with at Least as Much as Lower Bound of Each Interval (in thousands)	Percent of People with at Least as Much as Lower Bound of Each Interval
\$12,500 to \$14,999	935	21,724	92.3
\$15,000 to \$17,499	1,113	20,789	88.4
\$17,500 to \$19,999	1,298	19,675	83.6
\$20,000 to \$29,999	5,496	18,377	78.1
\$30,000 to \$39,999	4,596	12,881	54.7
\$40,000 to \$49,999	3,121	8,285	35.2
\$50,000 to \$59,999	1,902	5,164	21.9
\$60,000 to \$69,999	1,124	3,262	13.9
\$70,000 and above	2,138	2,138	9.1

Using these data, the mean monthly cash income for persons aged 25 to 34 is \$38,703. Applying Formula (5b), the approximate population variance, s^2, is:

$$s^2 = \left(\frac{370}{23{,}527}\right)(2{,}500)^2 + \cdots + \left(\frac{2{,}138}{23{,}527}\right)(105{,}000)^2 - (38{,}703)^2 = 649{,}442{,}787$$

Using Formula (4) and a b parameter of 8,267 from Table 7, the estimated standard error of a mean $\bar{x}$ is:

$$s_{\bar{x}} = \sqrt{\frac{8{,}267}{23{,}527{,}000} \times 649{,}442{,}787} = \$478$$

Thus, the approximate 90 percent confidence interval as shown by the data ranges from \$37,917 to \$39,489.

<u>Method 2</u>

Suppose that we are interested in estimating the average length of spells of SNAP recipiency from January 2017 to December 2018, for the Black subpopulation. Also, suppose there are only 10 sample people in the subpopulation who were recipients of SNAP benefits. This example is a hypothetical situation used for illustrative purposes only; actually, 10 sample cases would be too few for a reliable estimate and the sum of weights is lower than the recommended minimum value of 300,000. The number of consecutive months of SNAP recipiency during the reference period of interest and two-year longitudinal weights (*FINYR2*) are given in Table B below for each sample person:

Table B. Hypothetical Supplemental Nutrition Assistance Program (SNAP) Recipiency Spells from January 2017 to December 2018 among SIPP Sample Persons (Not Actual Data, Only Use for Calculation Illustrations).

Sample Person	**Spell Length in Months**	**Two-Year Longitudinal Weight (*FINYR2*)**
1	4, 3	13,763
2	5	4,102
3	9	9,662
4	3, 3, 2	4,859
5	12	7,169
6	12	9,466
7	4, 1	10,682
8	7	10,161
9	6	11,782
10	4	11,749

Using Formula (6a), the average spell of SNAP recipiency is estimated to be:

$$\bar{x} = \frac{(13{,}763)(4) + (13{,}763)(3) + \cdots + (11{,}749)(4)}{13{,}763 + 13{,}763 + \cdots + 11{,}749} = \frac{684{,}526}{127{,}558} = 5.37$$

The standard error will be computed by Formula (4). First, the estimated population variance can be obtained by Formula (6b):

$$s^2 = \frac{(13{,}763)(2)^2 + (13{,}763)(2)^2 + \cdots + (11{,}749)(4)^2}{13{,}763 + 13{,}763 + \cdots + 11{,}749} - 5.37^2 = 10.54(months)^2$$

Next, the base b parameter of 14,500 is taken from Table 8 and multiplied by the factor computed from Formula (2):

$$g = \frac{2^2 + 1 + 1 + 3^2 + 1 + 1 + 2^2 + 1 + 1 + 1}{2 + 1 + 1 + 3 + 1 + 1 + 2 + 1 + 1 + 1} = 1.71$$

Therefore, the final b parameter is $1.71 \times 14{,}500 = 24{,}795$ and the standard error of the mean from Formula (4) is:

$$s_{\bar{x}} = \sqrt{\frac{(24{,}795)(10.54)}{127{,}558}} = 1.43\ months$$

3.7 Standard Error of an Aggregate

An aggregate is defined to be the total quantity of an item summed over all the units in a group. The standard error of an aggregate can be approximated using Formula (7). As with the estimate of the standard error of a mean, the estimate of the standard error of an aggregate will generally underestimate the true standard error. Let y be the size of the base, s^2 be the estimated population variance of the item obtained using Formula (5b) or Formula (6b) and b be the parameter associated with the particular type of item. The standard error of an aggregate is:

$$s_x = \sqrt{b \times y \times s^2}. \tag{7}$$

3.8 Standard Errors of Estimated Percentages

The reliability of an estimated percentage, computed using sample data for both numerator and denominator, depends upon both the size of the percentage and the size of the total upon which the percentage is based. Estimated percentages are relatively more reliable than the corresponding estimates of the numerators of the percentages, particularly if the percentages are 50 percent or more. For example, the percent of people employed is more reliable than the estimated number of people employed. When the numerator and denominator of the percentage have different parameters, use the parameter (and appropriate factor) of the numerator. If proportions are presented instead of percentages, note that the standard error of a proportion is equal to the standard error of the corresponding percentage divided by 100.

There are two types of percentages commonly estimated. The first is the percentage of people sharing a particular characteristic such as the percent of people owning their own home. The second type is the percentage of money or some similar concept held by a particular group of people or held in a particular form. Examples are the percent of total wealth held by people with high income and the percent of total income received by people on welfare.

For the percentage of people, the approximate standard error, $s_{(x,p)}$, of the estimated percentage p can be obtained by the formula:

$$s_{(x,p)} = \sqrt{\frac{b}{x}(p)(100-p)}, \tag{8}$$

Here x is the size of the subclass of social units which is the base of the percentage, p is the percentage $(0 < p < 100)$, and b is the parameter associated with the characteristic in the numerator.

Illustration 3.

Suppose that using the *FINYR2* weights it was estimated that 18,310,000 males were in poverty in 2017 and an estimated 5.97 percent of them exited poverty in 2018. Using Formula (8), with a b parameter of 12,310 from Table 8, the approximate standard error is:

$$s_{(x,p)} = \sqrt{\frac{12{,}310}{18{,}310{,}000} \times 5.97 \times (100 - 5.97)} = 0.61\, percent$$

Consequently, the 90 percent confidence interval as shown by these data is from 4.97 percent to 6.97 percent.

For percentages of money, a more complicated formula is required. A percentage of money will usually be estimated in one of two ways. It may be the ratio of two aggregates:

$$p_R = 100\left(\frac{x_A}{x_B}\right),$$

or it may be the ratio of two means with an adjustment for different bases:

$$p_R = 100\left(\hat{p}_A\left(\frac{\bar{x}_A}{\bar{x}_B}\right)\right),$$

where x_A and x_B are aggregate money figures, $\bar{x}_A$ and $\bar{x}_B$ are mean money figures, and $\hat{p}_A$ is the estimated number in group A divided by the estimated number in group B. In either case, we estimate the standard error as

$$s_{(x,p_R)} = \sqrt{\left(\frac{\hat{p}_A\bar{x}_A}{\bar{x}_B}\right)^2\left[\left(\frac{s_p}{\hat{p}_A}\right)^2 + \left(\frac{s_A}{\bar{x}_A}\right)^2 + \left(\frac{s_B}{\bar{x}_B}\right)^2\right]}, \qquad (9)$$

where s_p is the standard error of $\hat{p}_A$, s_A is the standard error of $\bar{x}_A$ and s_B is the standard error of $\bar{x}_B$. To calculate s_p, use Formula (8). The standard errors of $\bar{x}_B$ and $\bar{x}_A$ may be calculated using Formula (4).

It should be noted that there is frequently some correlation between $\hat{p}_A$, $\bar{x}_B$, and $\bar{x}_A$. Depending on the magnitude and sign of the correlations, the standard error will be over or underestimated.

Illustration 4.

In 2018, 6.87 percent of households owned rental property. The mean value of rental property among these households who own them is \$450,900, the mean value of assets among all households is \$579,700 and the corresponding standard errors are 0.171 percent, \$21,560, and \$15,980 respectively. Then the percent of all household assets held in rental property is:

$$100\left(0.0687 \times \frac{450{,}900}{579{,}700}\right) = 5.34\,percent$$

Using Formula (9), the corresponding standard error is

$$s_{(x,p_R)} = \sqrt{\left(\frac{0.0687 \times 450{,}900}{579{,}700}\right)^2 \left[\left(\frac{0.00171}{0.0687}\right)^2 + \left(\frac{21{,}560}{450{,}900}\right)^2 + \left(\frac{15{,}980}{579{,}700}\right)^2\right]}$$
$$= 0.324\,percent$$

3.9 Standard Error of a Difference

The standard error of a difference between two sample estimates is approximately equal to

$$s_{(x-y)} = \sqrt{{s_x}^2 + {s_y}^2 - r s_x s_y} \qquad (10)$$

where s_x and s_y are the standard errors of the estimates *x* and *y*.

The estimates can be numbers, percent, ratios, etc. The correlation between x and y is represented by *r*. The above formula assumes that the correlation coefficient between the characteristics estimated by *x* and *y* is non-zero. If no correlations have been provided for a given set of x and y estimates, assume *r* = 0. However, if the correlation is positive (negative), then this assumption will tend to cause overestimates (underestimates) of the true standard error.

<u>Illustration 5.</u>
Supposed that SIPP estimates show 951,500 Hispanic males and 1,076,000 Hispanic females received Federal and/or State administered Supplemental Security Income (SSI) in December 2018. Then, using the *Male Hispanic* GVF parameters ($a = -0.00030810\ and\ b = 9{,}274$) and the *Female Hispanic* GVF Parameters ($a = -0.00030980\ and\ b = 9{,}274$) from Table 7 and Formula (3), the standard errors of these numbers are approximately 92,441 and 98,082 respectively. The difference in sample estimates is 124,500 and using Formula (10), the approximate standard error of the difference is:

$$\sqrt{92{,}441^{\,2} + 98{,}082^{\,2}} = 134{,}779$$

Suppose that it is desired to test at the 10 percent significance level whether the number of female Hispanic SSI recipients was different from the number of male Hispanic SSI recipients in December 2017. To perform the test, compute the Z statistic and compare it to the critical value of 1.645 for the 10 percent significance level.

$$Z = \frac{124{,}500}{134{,}779} = 0.92$$

Since 0.92 is less than 1.645, we can conclude that the number of male and female Hispanic SSI recipients are not significantly different at the 10 percent significance level.

3.10 Standard Error of a Median

The median quantity of some item such as income for a given group of people is that quantity such that at most 50 percent of the group have less and at most 50 percent of the group have more. The sampling variability of an estimated median depends upon the form of the distribution of the item as well as the size of the group. To calculate standard errors on medians, the procedure described below may be used.

The median, like the mean, can be estimated using either data which have been grouped into intervals or ungrouped data. If grouped data are used, the median is estimated using Formula (11) or (12) with $q = 0.5$, where q is the proportion of a group possessing characteristics of interest. If ungrouped data are used, the data records are ordered based on the value of the characteristic, then the estimated median is the value of the characteristic such that the weighted estimate of half – i.e. 50 percent – of the subpopulation falls at or below that value and half is at or above that value. Note that the method of standard error computation which is presented here requires the use of grouped data. Therefore, it should be easier to compute the median by grouping the data and using Formula (11) or (12).

An approximate method for measuring the reliability of an estimated median is to determine a confidence interval about it. (See the section on sampling variability for a general discussion of confidence intervals.) The following procedure may be used to estimate the 68 percent confidence limits and hence the standard error of a median based on sample data.

1. Determine, using $p = 50$ in Formula (8), the standard error of an estimate of 50 percent of the group.

2. Add to and subtract from 50 percent, the standard error determined in step 1.

3. Using the distribution of the item within the group, calculate the quantity of the item such that the percent of the group with more of the item is equal to the smaller percentage found in step 2. This quantity will be the upper limit for the 68 percent confidence interval. In a similar fashion, calculate the quantity of the item such that the percent of the group with more of the item is equal to the larger percentage found in step 2. This quantity will be the lower limit for the 68 percent confidence interval.

4. Divide the difference between the two quantities determined in step 3 by two to obtain the standard error of the median.

To perform step 3, it will be necessary to interpolate. Different methods of interpolation may be used. The most common are simple linear interpolation and Pareto interpolation. The appropriateness of the method depends on the form of the distribution around the median. If density is declining in the area, then we recommend Pareto interpolation. If density is fairly constant in the area, then we recommend linear interpolation. Note, however, that Pareto interpolation can never be used if the interval contains zero or negative measures of the item of interest. Interpolation is used as follows.

The quantity of the item such that p percent have more of the item is:

$$X_{pN} = A_1 \times \exp\left[\left(\frac{\ln\left(\frac{qN}{N_1}\right)}{\ln\left(\frac{N_2}{N_1}\right)}\right)\ln\left(\frac{A_2}{A_1}\right)\right] \tag{11}$$

if Pareto Interpolation is indicated and:

$$X_{pN} = \left[A_1 + \left(\frac{qN - N_1}{N_2 - N_1}\right)(A_2 - A_1)\right], \tag{12}$$

if linear interpolation is indicated, where:

N	is the size of the group,
A_1 and A_2	are the lower and upper bounds, respectively, of the interval in which X_{pN} falls
$N_1 and$ N_2	are the estimated number of group members owning more than A_1 and A_2, respectively
exp	refers to the exponential function and
ln	refers to the natural logarithm function
q	is the corresponding proportion for p i.e., $q = p/100$

Illustration 6.
To illustrate the calculations for the sampling error on a median, we return to Table A from illustration 2. The median annual income for this group using Formula (11) is $31,828. The size of the group is 23,527,000.

1. Using Formula (8), the standard error of 50 percent on a base of 23,527,000 is about 0.94 percentage points.

2. Following step 2, the two percentages of interest are 49.06 and 50.94.

3. By examining Table A, we see that the percentage 49.06 falls in the income interval from \$30,000 to \$39,999. (Since 54.7 percent receive more than \$30,000 per annum, the dollar value corresponding to 49.06 must be between \$30,000 and \$40,000.) Thus, $A_1 = \$30{,}000, A_2 = \$40{,}000, N_1 = 12{,}881{,}000 \; and \; N_2 = 8{,}285{,}000$.

In this case, we decided to use Pareto interpolation. Therefore, using Formula (11), the upper bound of a 68 percent confidence interval for the median is

$$\$30{,}000 \times \exp\left[\left(\frac{\ln\left(\frac{0.4906 \times 23{,}527{,}000}{12{,}881{,}000}\right)}{\ln\left(\frac{8{,}285{,}000}{12{,}881{,}000}\right)}\right) \times \ln\left(\frac{40{,}000}{30{,}000}\right)\right] = \$\,32{,}225\,.$$

Also, by examining Table A, we see that 50.94 falls in the same income interval. Thus, $A_1, A_2, N_1 and\; N_2$ are the same. We also use Pareto interpolation for this case. So, the lower bound of a 68 percent confidence interval for the median is

$$\$30{,}000 \times \exp\left[\left(\frac{\ln\left(\frac{0.5094 \times 23{,}527{,}000}{12{,}881{,}000}\right)}{\ln\left(\frac{8{,}285{,}000}{12{,}881{,}000}\right)}\right) \times \ln\left(\frac{40{,}000}{30{,}000}\right)\right] = \$\,31{,}444\,.$$

Thus, the 68 percent confidence interval on the estimated median is from \$31,444 to \$32,225.

4. Then the approximate standard error of the median is

$$\frac{\$\,32{,}225 \; - \$\,31{,}444}{2} = \$390.5$$

3.11 Standard Errors of Ratios of Means and Medians

The standard error for a ratio of means or medians is approximated by:

$$s_{\frac{x}{y}} = \sqrt{\left(\frac{x}{y}\right)^2 \left[\left(\frac{s_y}{y}\right)^2 + \left(\frac{s_x}{x}\right)^2\right]}, \qquad (13)$$

where x and y are the means or medians, and s_x and s_y are their associated standard errors. Formula (13) assumes that the means are not correlated. If the correlation between the population means estimated by x and y are actually positive (negative), then this procedure will tend to produce overestimates (underestimates) of the true standard error for the ratio of means.

3.12 Standard Errors Using Software Packages

Standard errors and their associated variance, calculated by statistical software packages such as SAS or Stata, do not accurately reflect the SIPP's complex sample design. Erroneous conclusions will result if these standard errors are used directly. We provide adjustment factors by characteristics that should be used to correctly compensate for likely under-estimates. The factors called design effects (DEFF), available in Tables 7 and 8, must be applied to SAS or Stata generated variances. The square root of DEFF can be directly applied to similarly generated standard errors. These factors approximate design effects which adjust statistical measures for sample designs more complex than simple random sample.

Replicate weights for SIPP are also provided and can be used to estimate more accurate standard errors and variances. While replicate weighting methods require more computing resources, many statistical software packages, including SAS, have procedures that simplify the use of replicate weights for users. To calculate variances using replicate weights use the formula:

$$Var(\theta_0) = \frac{1}{G(0.5)^2} \times \sum_{i=1}^{G} (\theta_i - \theta_0)^2 \tag{14}$$

where G=240 is the number of replicates, θ_0 is the estimate using full sample weights, and θ_i is the estimate using the i^{th} replicate weight. Replicate weights are created using Fay's method, with a Fay coefficient of 0.5 (Chakrabarty, 1993; Fay, 1984).

Instead of direct computation, various SAS procedures include options to use replicate weights when estimating standard errors or variances. Fay's method is a variation of the balanced repeated replication (BRR) method, so within SAS SURVEY procedures include the VARMETHOD=BRR(FAY=0.5) option in the PROC statement and specify the replicate weights with a REPWEIGHTS statement. Other computer packages have similar methods.

Formula (14) produces variance estimates close to zero for the median when multiple observations have value equal to the median. In this case, two methods can be used to estimate the variance of the median. The first technique incorporates replicate weights in Woodruff's method for estimating variability (Woodruff, 1952). Gossett et al. (2002) documents the procedure for combining Woodruff's method with Jackknife replication and provides sample codes adapted by Mack and Tekansik (2011) for Fay's BRR. The second method uses VARMETHOD=TAYLOR option, a direct application of Woodruff's method, along with the cluster (GHLFSAM variable) and strata statements (GVARSTR variable) instead of replicate weights to account for SIPP's complex design.

Illustration 7.
In SAS, there are a set of SURVEY procedures that can use the replicate weights to estimate standard errors. All of these SAS procedures use the same VARMETHOD = BRR(FAY=0.5) option and REPWEIGHTS statement. The SURVEYMEANS procedure is used to estimate statistics such as means, totals, proportions, quantiles, and ratios for a survey sample, SURVEYFREQ is for frequency tables and cross-tabulations, SURVEYREG is for regression analysis, SURVEYLOGISTIC is for logistic regression analysis, and SURVEYPHREG is for proportional hazards regression analysis.

An example syntax for estimating the mean and median of the total household income (*THTOTINC*) for any month in 2018 using SIPP replicate weights is:

```
proc surveymeans data=pu2019[12] varmethod=brr(Fay=0.5) mean median[13];
  var THTOTINC;
  weight WPFINWGT;
  repweights REPWGT1-REPWGT240;
run;
```

Alternatively, to fit a regression model with the total household income (*THTOTINC*) as the response variable and several household characteristics such as age (*TAGE*), race (*ERACE*), Hispanic origin (*EORIGIN*), and educational attainment (*EEDUC*) of the reference person, number of persons in the household (*RHNUMPER*), tenure (*EEHC_TEN*), and region (*TEHC_REGION*) as the predictor variables the SAS syntax is:

```
proc surveyreg data=pu2019 varmethod=brr(Fay=0.5);
  class ERACE EORIGIN EEHC_TEN TEHC_REGION;
  model THTOTINC = TAGE ERACE EORIGIN EEDUC RHNUMPER EEHC_TEN TEHC_REGION;
  weight WPFINWGT;
  repweights REPWGT1-REPWGT240;
run;
```

In Stata, the SVY command is used to fit a statistical model to a complex survey dataset. SVYSET is used to determine the survey design and provide information about the variance estimation. The following Stata syntax is equivalent to using SURVEYMEANS in SAS:

```
use pu2019.dta
svyset [pweight= WPFINWGT], brrweight(REPWGT1-REPWGT240) fay(.5) vce(brr) mse
svy: mean THTOTINC
```

[12] This snippet of code requires the analytic, final weight, and replicate weights variables – *THTOTINC, WPFINWGT, and REPWGT1-REPWGT240* respectively – are included in the dataset *pu2019* and that *pu2019* is restricted to the month of interest.
[13] The documentation for the Surveymeans procedure provides a list of “statistic keywords” that can be supplied to compute estimates of different statistics.

4. References

Chakrabarty, R. P. (1993). Variance estimation by users of SIPP micro-data files [Working Paper]. https://www.census.gov/content/dam/Census/library/working-papers/1993/adrm/rr93-6.pdf

Fay, R. E. (1984). Some properties of estimates of variance based on replication methods. *Proceedings of the Section on Survey Research Methods*, American Statistical Association, 495-500.

Gossett, J. M., Simpson, P., Parker, J.G., & Simon, W.L. (2002). How complex can complex survey analysis be with SAS? Proceedings of the 27th Annual SAS Users Group International Conference. https://support.sas.com/resources/papers/proceedings/proceedings/sugi27/p266-27.pdf

Kalton, G. (1998). SIPP quality profile [Working Paper]. U.S. Census Bureau. https://www.census.gov/content/dam/Census/library/working-papers/1998/demo/SEHSD-WP1998-11.pdf

Mack, S. & Tekansik, S. (2011). "Calculating Standard Errors and Confidence Intervals of Medians." U.S. Census Bureau Memorandum for Documentation dated May 6, 2011.

Sedgwick, P. (2014). Multiple hypothesis testing and Bonferroni's correction. BMJ: British Medical Journal, 349. https://www.jstor.org/stable/26517649

Stoline, M. (1981). The status of multiple comparisons: simultaneous estimation of all pairwise comparisons in one-way ANOVA designs. The American Statistician, 35(3), 134-141. https://www.jstor.org/stable/2683979

Tersine Jr., A.G. (2020a). "Survey of Income and Program Participation 2018: Weighting Specifications for Wave 1 (WGT-29)." U.S. Census Bureau Memorandum from Anthony G. Tersine, Jr. to Jeffrey Sessions. Not yet finalized

Tersine Jr., A.G. (2021a). "Survey of Income and Program Participation Cross-sectional Weighting Specifications for Calendar Year 2019 and Subsequent Years (WGT-34)." U.S. Census Bureau Memorandum from Anthony G. Tersine, Jr. to Jeffery Sessions. Not yet finalized

Tersine Jr., A.G. (2021b). "Survey of Income and Program Participation Longitudinal Weighting Specifications for Calendar Year 2019 and Subsequent Years (WGT-35)." U.S. Census Bureau Memorandum from Anthony G. Tersine, Jr. to Jeffery Sessions. Not yet finalized

U.S. Census Bureau. (2019). Survey of Income and Program Participation: 2014 Panel Users' Guide. Washington, D.C. https://www.census.gov/programs-surveys/sipp/guidance/users-guide.html

U.S. Census Bureau. (2020). Survey of Income and Program Participation: 2018 Panel Users' Guide. Washington, D.C. Revised August 2021. https://www.census.gov/programs-surveys/sipp/guidance/users-guide.html

U.S. Census Bureau. (2021). Survey of Income and Program Participation: 2019 Panel Users' Guide. Washington, D.C. https://www.census.gov/programs-surveys/sipp/guidance/users-guide.html

Wolter, K. M. (2007). Chapter 7: Generalized variance functions, Introduction to Variance Estimation, 2nd Ed. New York: Springer, pp. 272-297.

Woodruff, R. S. (1952). Confidence intervals for medians and other position measures. Journal of the American Statistical Association, 47(260), 635-646.

5. Generalized Variance Parameters and Tables

Table 7. Cross-Sectional Generalized Variance Parameters for CY19 data

Domain	Parameters *a*	*b*	Design Effect[14]
Poverty and Program Participation, Persons 15+			
Total	-0.00003424	9,006	3.364
Male	-0.00007073	9,006	
Female	-0.00006637	9,006	
Income and Labor Force Participation, Persons 15+			
Total	-0.00003143	8,267	3.088
Male	-0.00006493	8,267	
Female	-0.00006093	8,267	
Other, Persons 0+			
Total (or White)	-0.00002667	8,640	3.227
Male	-0.00005452	8,640	
Female	-0.00005220	8,640	
Black, Persons 0+	-0.00024840	10,630	3.971
Male	-0.00053030	10,630	
Female	-0.00046730	10,630	
Hispanic, Persons 0+	-0.00015450	9,274	3.464
Male	-0.00030810	9,274	
Female	-0.00030980	9,274	
Households			
Total (or White)	-0.00005642	7,396	2.763
Black	-0.00041450	7,396	
Hispanic	-0.00040260	7,396	

Source: U.S. Census Bureau, Survey of Income and Program Participation, Calendar Year 2019.

Notes on Domain Usage for Table 8

Poverty and Program Participation	Use these parameters for estimates concerning poverty rates, welfare program participation (e.g. Supplemental Security Income, SSI), and other programs for adults with low incomes.
Income and Labor Force	These parameters are for estimates concerning income, sources of income, labor force participation, economic well-being other than poverty, employment related estimates (e.g. occupation, hours worked a week), and other income, job, or employment related estimates.
Other Persons	Use the “Other Persons” parameters for estimates of total (or white) persons aged 0+ in the labor force, and all other characteristics not specified in this table, for the total or white population.
Black/Hispanic Persons	Use these parameters for estimates of Black and Hispanic persons 0+.
Households	Use these parameters for all household level estimates.

[14] Design Effect=b/sample interval where sample interval=2,677

Table 8. Longitudinal Generalized Variance Parameters for CY19 data

Domain	Parameters *a*	Parameters *b*	Design Effect[15]
Poverty and Program Participation, Persons 15+			
Total	-0.00004679	12,310	4.598
Male	-0.00009665	12,310	
Female	-0.00009069	12,310	
Income and Labor Force Participation, Persons 15+			
Total	-0.00004237	11,140	4.161
Male	-0.00008753	11,140	
Female	-0.00008213	11,140	
Other, Persons 0+			
Total (or White)	-0.00003598	11,660	4.356
Male	-0.00007356	11,660	
Female	-0.00007043	11,660	
Black, Persons 0+	-0.00033890	14,500	5.417
Male	-0.00072360	14,500	
Female	-0.00063760	14,500	
Hispanic, Persons 0+	-0.00020970	12,590	4.703
Male	-0.00041820	12,590	
Female	-0.00042050	12,590	
Households			
Total (or White)	-0.00007417	9,725	3.633
Black	-0.00055260	9,725	
Hispanic	-0.00053370	9,725	

Source: U.S. Census Bureau, Survey of Income and Program Participation, Calendar Year 2019.

Notes on Domain Usage for Table 8

Poverty and Program Participation	Use these parameters for estimates concerning poverty rates, welfare program participation (e.g. Supplemental Security Income, SSI), and other programs for adults with low incomes.
Income and Labor Force	These parameters are for estimates concerning income, sources of income, labor force participation, economic well-being other than poverty, employment related estimates (e.g. occupation, hours worked a week), and other income, job, or employment related estimates.
Other Persons	Use the "Other Persons" parameters for estimates of total (or white) persons aged 0+ in the labor force, and all other characteristics not specified in this table, for the total or white population.
Black/Hispanic Persons	Use these parameters for estimates of Black and Hispanic persons 0+.
Households	Use these parameters for all household level estimates.

[15] Design Effect=b/sample interval where sample interval=2,677